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ABSTRACT

Six specifications are described as factors influencing the form and content of instructional systems. They are 1) that the program shall develop teachers' ability to bring about selected objectives, and shall be judged effective to the extent that such competencies are realized; 2) that the ability to bring about selected objectives of the schools shall be demonstrated under both simulated and real-life educational settings; 3) that the teacher education program shall be derived systematically from the outcomes desired from the schools; 4) that instructional experiences shall occur within the context of an instructional system; 5) that the demonstration of mastery of the knowledge, skills, and sensitivities required for competence can be independent of situation, but the demonstration of competence must always be situation specific; 6) that each instructional system should be designed to maximize the personalization process. General steps to be followed in the design and development of instructional systems are outlined, and examples of some of the forms which learning experiences might assume are provided. Related documents are SP 004 155 to SP 004 162 and SP 004 164 to SP 004 166. (MBM)

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APPENDIX I

NOTES ON THE DESIGN AND DEVELOPMENT OF INSTRUCTIONAL SYSTEMS

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NOTES ON THE DESIGN AND DEVELOPMENT OF INSTRUCTIONAL SYSTEMS

As used in the proposed program an instructional system is an empirically developed set of learning experiences which bring about a given competency for a given set of prospective teachers with a given degree of reliability. Included within an instructional system are learning experiences that lead to a mastery of the knowledges, skills, and sensitivities that are thought to be prerequisite to the ability to bring about a given educational outcome, and practice in the integration of these knowledges and skills until there is evidence that the desired outcome can in fact be achieved. As such, an instructional system is always organized around a desired educational outcome and may include learning experiences of any and all kinds, for example, lectures, small group discussions, reading, observation of films or real-life settings, simulation or micro-teaching experiences, practice teaching with feedback, etc. Also, as a means to the personalization of instructional experiences, all instructional systems are designed with multiple entry points and multiple paths to pursue, thus permitting students to enter at levels commensurate with their backgrounds and progress through them at a rate and in a manner that is commensurate with their learning style.

Factors Influencing the Form and Content of Instructional Systems

Specification 1: that the Instructional program shall be designed to develop in prospective teachers the ability to bring about selected objectives of the school, and that the program shall be judged effective to the extent that such competencies are realized.[1]

IMPLICATIONS

1. Before curriculum development can be undertaken the objectives of the elementary school must be specified.

2. In addition to specifying the objectives of the schools the general classes of indicators acceptable as evidence of the realization of those objectives must be specified.

3. Evidence must be provided ultimately that the program does

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[1] Competency in the realization of two classes of educational outcomes is to be demonstrated: the realization of desired pupil outcomes (instructional management competencies) and the realization of non-instructional outcomes (instructional support competencies).

or does not prepare teachers to be able to bring about the objectives specified.

Specification 2: that the ability to bring about selected objectives of the schools shall be demonstrated under both simplifed (simulated) and ongoing (real-life) educational settings.

IMPLICATIONS

1. Simplified or simplifiable educational contexts must be identified within which instructional management competencies can be demonstrated.

2. Real-life educational settings must be identified within which instructional management and instructional support competencies can be demonstrated.

Specification 3: That the teacher education program shall be derived systematically from the outcomes desired from the schools.

IMPLICATIONS

1. The first step in the derivation of a competency based teacher education program, after the objectives of the schools have been specified, is the identification of the conditions which bring about the realization of those objectives. In the theory of instruction or "influence behavior" that underlies the ComField model four sets of variables must always be considered in this regard: a) the characteristics of the learner or other person in the situation to be influenced, b) the context within which the influence is to occur, c) the strategy to be used in bringing about the influence--given the characteristics of the person to be influenced, the setting in which influence is to occur and the outcome to be realized --and, d) the content to be carried by the strategy. The interaction of these variables in the teaching process have been discussed in detail in Appendix H.

2. Once the conditions that bring about the desired outcomes have been specified (so far as existing knowledge permits such specification), the next step in program development requires the specification of the knowledges, skills, and sensitivities that teachers need in order to create such conditions. This class of activity constitutes what Gagne and others have called a "hierarchical" or "objective" analysis, and represents one of the most critical and demanding tasks that face the designers of a teacher education program. For a detailed discussion of the methodology of hierarchical analysis, see Twelker's chap-

ter in the National Research Training Manual.[1]

3. Once the analysis outlined in (2) has been completed, it is then possible to specify the conditions (learning experiences) by which teachers can master the knowledges, skills, and sensitivities that are needed in order to establish the conditions that will bring the desired outcomes about. As in the case of pupil outcomes, however, specification of the conditions that bring about such outcomes on the part of prospective teachers is also limited by available knowledge. At this point in time empirical evidence as to the relationship of a particular set of conditions to a particular learning outcome for prospective teachers is limited, so the design of learning experiences within the teacher education program must of necessity be based upon wisdom, hunch, and commitment to a continuous trial and error process until an effective set of learning experiences has been developed.

The sequence of steps involved in the systematic design of a ComField based teacher education program is illustrated schematically in Figure 1.

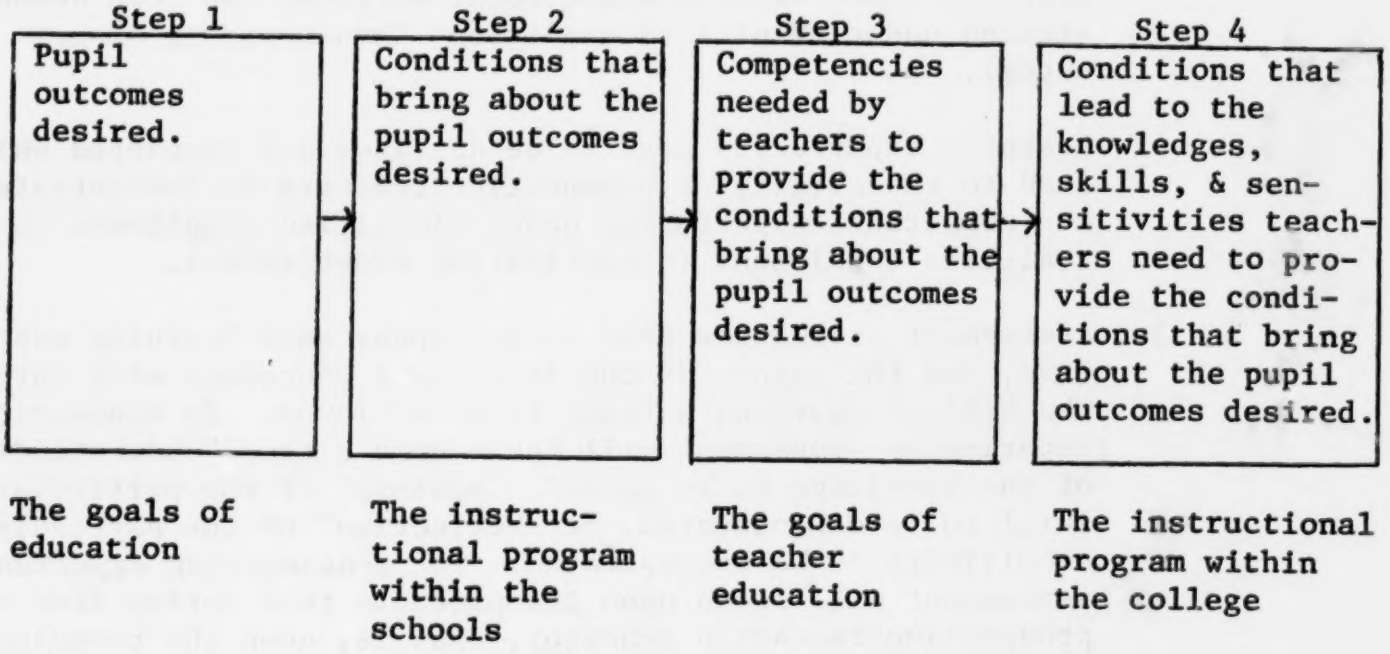
Step 1
Pupil outcomes desired.
Step 2
Conditions that bring about the pupil outcomes desired.
Step 3
Competencies needed by teachers to provide the conditions that bring about the pupil outcomes desired.
Step 4
Conditions that lead to the knowledges, skills, & sensitivities teachers need to provide the conditions that bring about the pupil outcomes desired.
The goals of education
The instructional program within the schools
The goals of teacher education
The instructional program within the college

Figure 1. The model to be followed in the design of a teacher education curriculum that prepares teachers to bring about the learning outcomes desired in pupils.

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[1] Twelker, P. A. Designing Instructional Systems. In Jack Crawford (ed.) National Research Training Manual (2nd edition), Monmouth, Oregon: Teaching Research, 1969.

Specification 4: that instructional experiences shall occur within the context of an "instructional system," with an instructional system being defined as "an empirically developed set of learning experiences that will bring about a given competency for a given set of prospective teachers with a given degree of reliability."

IMPLICATIONS

1. Orienting experiences need to be developed which provide prospective teachers with a referent for the desired competency, i.e., what a given pupil outcome or instructional support outcome looks like (orienting experiences).

2. Learning experiences need to be designed and developed which bring about mastery of the knowledges, skills, and sensitivities that prospective teachers need in order to create the conditions that will bring about the educational outcomes desired (foundations experiences).

3. Learning experiences need to be designed and developed which lead to the synthesis of the knowledges, skills, and sensitivities mastered at the foundations level until competency in bringing about desired educational outcomes has been demonstrated under simplified conditions (synthesizing experiences).

4. Learning experiences need to be designed and developed which lead to the ability of prospective teachers to demonstrate the competencies performed under simplified conditions in real-life conditions (consolidating experiences).

5. Assessment procedures need to accompany each learning experience, and the nature of the assessment procedure will vary by the kind of learning outcome to be achieved. In foundations experiences assessment will focus upon either "understanding" of the knowledge to be gained, "mastery" of the particular skill to be demonstrated, or "reflection" of the particular sensitivity to be incorporated. For synthesizing experiences assessment will focus upon the products that derive from a prospective teacher's behavior, that is, upon the behavior of a pupil or set of pupils as evidence of the realization of a desired educational outcome or upon the behavior of a parent as evidence of his understanding of the program in simplified educational situations. The focus of assessment at the consolidation level is the same as it is for synthesis except that competence is to be demonstrated in a real-life educational context.

A relatively detailed discussion of the design of instructional experiences and the assessment of their effectiveness appears in Appendix H.

6. Evidence needs to be provided that each instructional experience in fact accomplishes that which it has been designed to accomplish.

Specification 5: the demonstration of mastery of the knowledges, skills, and sensitivities prerequisite to competence can be independent of situation; the demonstration of competence must always be situation-specific.

IMPLICATIONS

1. When assessing prerequisite knowledges, skills, and sensitivities relatively "standardized" criteria can be applied in determining mastery, that is, a given "level" of knowledge or a given "degree" of mastery can be established and used as a standard against which to assess the performance of all prospective teachers in the program.

2. Procedures have to be developed which permit the negotiation of the contexts within which to demonstrate a given competency, the criteria by which to be judged competent within that context, and the procedures to be used in obtaining evidence on the negotiated indicators. The procedures to be followed in this regard in the proposed program have been outlined under the personalization process in CHAPTERS 1 and 8.

3. Provision must be made for the demonstration of a given competency within a number of situations (the range and the focus of such situations may be arbitrarily established or may be negotiated with each student in relation to each competency).

Specification 6: each instructional system shall be designed so as to maximize the personalization process.

IMPLICATIONS

1. Each learning outcome to be realized within the program, that is, each prerequisite knowledge, skill, and sensitivity to be mastered for each competency to be demonstrated, is to have multiple learning experiences designed to lead to its realization. (The number of options should be limited only by the resources available or the ability to generate them.)

2. Multiple assessment procedures are to accompany each learning experience. For foundations experiences three levels of mastery indication are to be provided for each experience:

   - knowledge indicators: an emphasis on recall and/or the ability to recognize information;

- comprehension indicators: an emphasis upon translation, interpretation and/or extrapolation;

- commitment indicators: an emphasis on the student's feelings about that which is being mastered or his willingness to engage in the experience which pertains to it.

The specific set of indicators to be used as evidence of competence at either the synthesis or the consolidation level are negotiated at the time of competence demonstration.

3. Extensive and long term supervision are required within the Clinical and Intern settings.

4. Each instructional experience needs to be designed with multiple entry points and with the capability of assessing individuals who wish to engage in a learning experience to determine their level of entry.

5. Procedures must be developed which permit the by-passing of learning experiences which lead to knowledge or skill or sensitivity or competency which a prospective teacher already possesses, and which permit recycling within a given instructional experience or a given instructional system until the level of mastery or competency desired or needed is gained.

6. An information storage and retrieval system must be developed which permits a student's performance in relation to any given learning experience to be catalogued and available upon call by the student or others at subsequent points in time.

Generalized Steps in the Design and Development of Instructional Systems

1. Specify the objectives of the elementary schools and the classes of indicators acceptable as evidence of their realization (see Specification 1 above).

2. Specify the conditions which will bring the objectives of the school about and the knowledges, skills, and sensitivities needed by teachers in order to create such conditions (see Specification 3 above).

3. Specify the conditions which will lead to the mastery of the knowledges, skills, and sensitivities (see Specification 4 above).

4. Specify the classes of measures to be used in obtaining the indicators acceptable as evidence of the realization of school objectives (see Specification 5 above).

5. Develop prototype instructional systems and measures on the basis of the designs outlined in (3) and (4).

6. Conduct a "try out" or informal field test of the prototype material.

7. Analyze the data that derives from the try outs and redesign the instructional and test systems in light of that data.

8. Conduct a formal field test with the instructional and test materials.

9. Recycle the design-development-field test process until there is evidence that the instructional system brings about the outcomes expected from it with given kinds of students at a given level of reliability.

Hamreus has discussed the process of instructional systems development in considerable detail[1] and depicts the process schematically as shown in Figure 2. Figure 3 represents another schematic of the process.

Comments on the Design and Development of Learning Experiences

As indicated previously the concept of an instructional system assumes multiple learning experiences for each sub or criterion outcome expected to derive from the system, and it assumes that these experiences will take a wide variety of forms. Listed below are some of the forms which learning experiences might assume in relation to the various levels of instructional experience appearing within a given system.

Orienting Experiences

Orienting experiences are intended to provide a set of referents as to the outcomes that are to be derived from engaging with the system. This includes criterion competency as well as mastery of the knowledges, skills, and sensitivities prerequisite to that competency. As such they provide a basis for negotiation and decision making between student and sponsor, and a point of orientation for both as a student moves through a system. In contrast to all other classes of learning experiences that appear within an instructional system orienting experiences do not contain indicators of mastery. Examples of orienting experiences include:

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[1] Hamreus, D. G. Instructional Systems Development. In Jack Crawford (ed.) National Research Training Manual (2nd Edition), Monmouth, Oregon: Teaching Research, 1969.

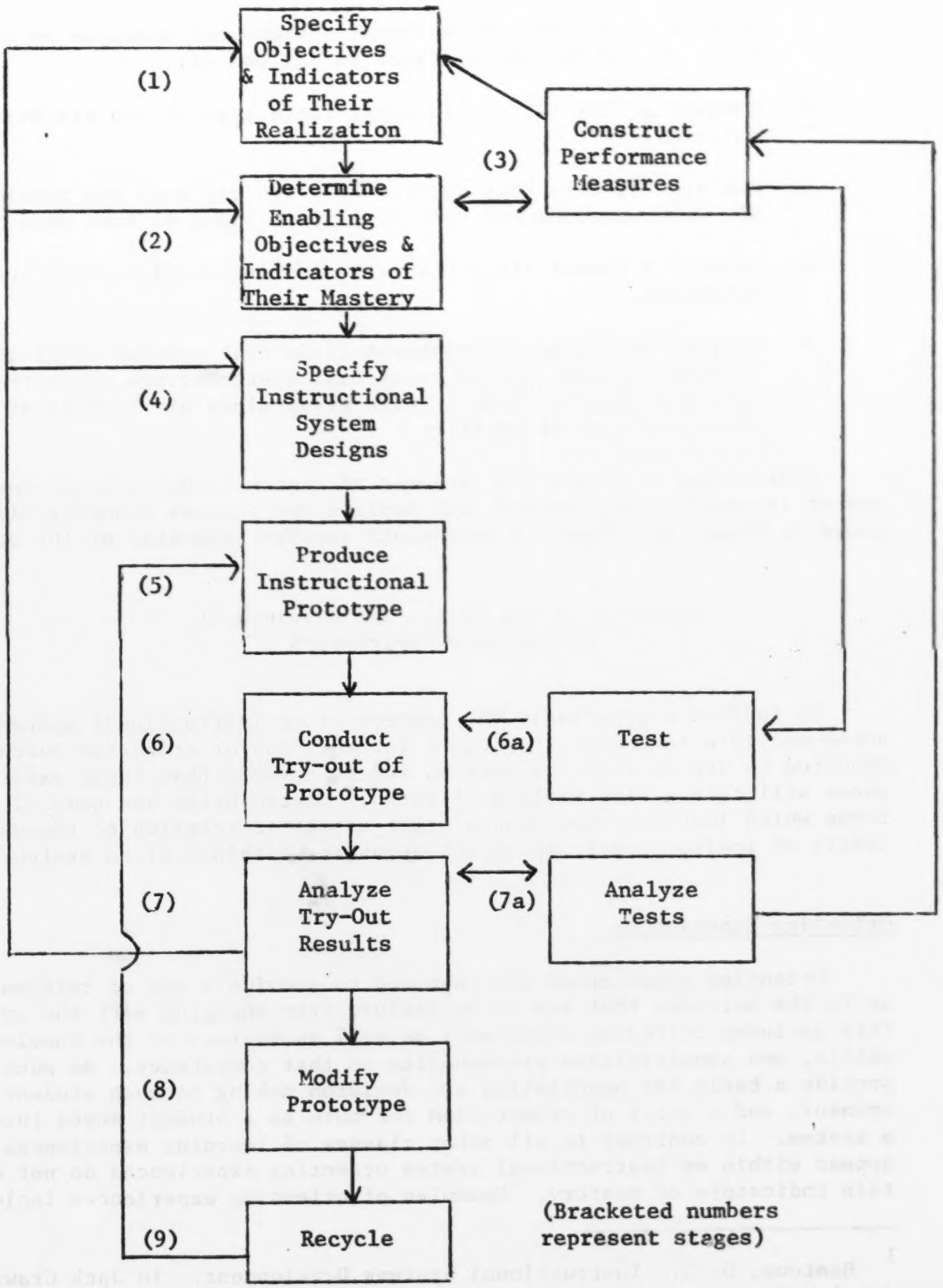

Figure 2. Major stages in system design for developing validated instructional systems.

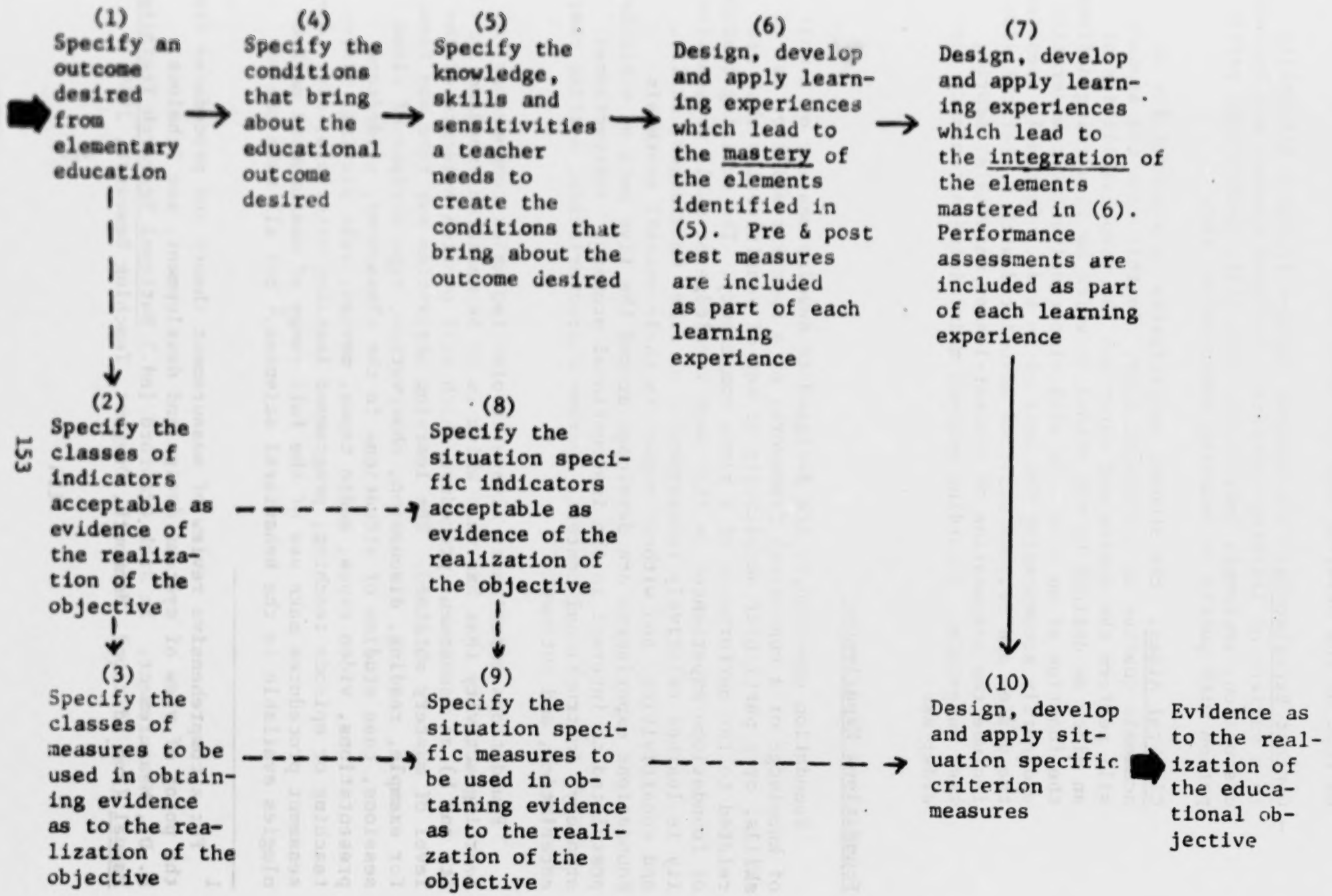
(1)
Specify an outcome desired from elementary education
(4)
Specify the conditions that bring about the educational outcome desired
(5)
Specify the knowledge, skills and sensitivities a teacher needs to create the conditions that bring about the outcome desired
(6)
Design, develop and apply learning experiences which lead to the mastery of the elements identified in (5). Pre & post test measures are included as part of each learning experience
(7)
Design, develop and apply learning experiences which lead to the integration of the elements mastered in (6). Performance assessments are included as part of each learning experience
(2)
Specify the classes of indicators acceptable as evidence of the realization of the objective
(8)
Specify the situation specific indicators acceptable as evidence of the realization of the objective
(3)
Specify the classes of measures to be used in obtaining evidence as to the realization of the objective
(9)
Specify the situation specific measures to be used in obtaining evidence as to the realization of the objective
(10)
Design, develop and apply situation specific criterion measures
Evidence as to the realization of the educational objective

Figure 3. The model that guides the design, development and application of the elementary teacher education program proposed by the OCE Coalition.

- Sensitizing Experiences: contact as an observer with a variety of alternative learning contexts. Notes, logs, or diaries may be kept on the observations for later use.

- Contact Experiences: the student engages learners informally in a variety of learning contexts. Informal contact may include discussion, impromptu interviews, chit chat, spontaneous participation with pupils in learning experiences, etc.

- Clerical Aides: the student participates in a school for an academic quarter as a clerical aide. In this role the student will perform the duties and carry out the responsibilities of an aide, as defined by the school in which he is working defines the function of an aide. He will also receive the remuneration ordinarily accompanying the work of an aide. Generally speaking the duties and responsibilities associated with a clerical aide include the preparation of teacher-leader materials; scoring test materials; recording grades; maintaining attendance records; etc.

Foundations Experiences

Foundation experiences are designed to develop mastery of a unit of knowledge or a conceptual framework, or a specific skill or set of skills; or a particular sensitivity or set of sensitivities that are related to the performance of a given competency. The defining feature of foundations experiences is that each knowledge or skill or sensitivity is learned relatively independently of other knowledges, skills, and sensitivities, and without regard to their overall synthesis. Foundations experiences are developed around the five sets of variables postulated to interact in the instructional process: instructional strategy, instructional content, learner characteristics, setting characteristics, and outcome.

Foundations experiences always involve two major components: a) learning activity that has that which is to be mastered imbedded in it; and b) an assessment procedure which will provide evidence of the level of mastery obtained. The learning activities may take any form, for example, reading, discussion, observation, type scripts of class sessions, case studies of situations in the classrooms, slide/tape presentations, video tapes, audio tapes, movies, role playing, microteaching or episode teaching, programmed learning materials, etc. Assessment procedures make use of the full range of measurement methodologies available to the behavioral sciences,[1] but all take one of

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[1] For a comprehensive review of measurement theory and procedures from the point of view of systems design and development, see Schalock, H. D., Measurement. In Jack Crawford (ed.) National Research Training Manual (2nd Edition), Monmouth, Oregon: Teaching Research, 1969.

four foci: knowledge, comprehension, demonstration or commitment. As indicated previously knowledge, as used in the present context, refers primarily to recall or recognition; comprehension to translation, interpretation or extrapolation; demonstration to the performance of a given skill at a given level of proficiency; and commitment to how a student feels about that which he has mastered and his willingness to utilize that knowledge, skill or sensitivity in his subsequent teaching.

Synthesizing Experiences

A laboratory experience is designed to bring about a synthesis of the knowledges, skills, and sensitivities mastered in the foundations experiences. The ultimate objective of the synthesizing experiences within a given instructional system is the demonstration of the competency for which the instructional system was designed, that is, a demonstration that a teacher can bring about a given educational outcome. As indicated previously the theory of instruction on which the program rests assumes that this involves an appropriate mix of instructional strategy and content with learner characteristics, setting characteristics, and outcome to be obtained. Learning experiences are also designed to bring about partial synthesis, that is, the synthesis of two or more of the sets of variables that need to be brought together to bring about a given outcome. Examples of partial syntheses include the ability to vary instructional strategy by learner characteristic (independent of instructional setting or content); learning to vary content by learner characteristic (independent of instructional strategy or setting characteristic); learning to match strategy with learner characteristics, and setting characteristics (ignoring content).

As in the case of foundations experiences synthesizing experiences contain both learning and assessment activities. In "learning," activities assume one of three forms: symbolic, simulated, or real-life. Symbolic learning forms include case studies, type scripts, cumulative folders, test results for individuals and class groups, etc. Simulated learning experiences include role playing, slide-tape or film or video tape presentations of classroom situations, etc. Real-life learning experiences include micro-teaching, episode teaching, bit teaching or tutoring situations. Assessment takes one of four foci: analysis, synthesis, application, and commitment. As used in the present context analysis refers to the ability of a prospective teacher to identify differing characteristics within a given situation that call for differential response; synthesis refers to the ability of a student to make alternative responses to the situation in light of its differential demand characteristics; and commitment refers to the student's feelings about that which is being required of him and his willingness to utilize that which is being synthesized in his future teaching.

As in the case of foundations experiences the full range of measure-

ment methodologies available to the behavioral sciences will need to be brought to bear in order to effectively assess the ability to perform partial or complete synthesis. To insure the generalizeability of a given competency it must be demonstrated under a variety (sample) of conditions.

Consolidating Experiences

A consolidating experience is designed to lead to the ability to demonstrate a given competency within the constraints of an ongoing educational setting. This requires the demonstration of the competency under a variety of instructional settings, thus allowing sampling across a wide array of student characteristics, instructional conditions, and variations in a given outcome. In addition, consolidating experiences require that the prospective teacher be able to diagnose the extent to which he has been successful in bringing about the desired outcome and provide alternative modes of operation if a desired outcome has not been achieved.[1]

As with the foundations and synthesizing experiences consolidating experiences consist of two parts: learning experiences and assessment procedures. While some symbolic and simulated instructional materials may be used in bringing about the consolidation of competency, the bulk of the learning experiences will be centered in the ongoing teaching-learning process. As such, procedures must be utilized for purposes of assessment, feedback, etc. which can mirror that which has transpired

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[1] Operationally consolidating experiences may involve the synthesis of two or more competencies demonstrated under simplified conditions since the level of generality of the competencies that can be demonstrated under such conditions is limited due to the constraints of time, etc. It is not possible, for example, to demonstrate competence in "getting children to be able to read" under simplified conditions. Rather a variety of "lower level" competencies will be demonstrated within the clinical setting which are prerequisite to the overall competency of reading ability, for example, the mastery of word attack skills, vocabulary, the differentiation of vowels and consonants, etc. Also, some competencies may be encountered in the Intern phase of the program that will not have been encountered previously. When this is the case all components within an instructional system, that is, orienting experiences, foundations experiences, and synthesizing experiences as well as consolidating experiences, will be engaged in while the student is serving as an intern. A number of instructional support competencies are expected to be handled in this way, for example, competence in research on or evaluation of instruction, competence in instructional materials design and development, and competence in interpreting school programs to parents.

in the instructional setting. Toward this end video tape and extensive observational records will come into play.

Consolidating assessment will be made at four levels: diagnosis, prescription, implementation, and evaluation. Within the present context diagnosis refers to the ability of a prospective teacher to identify the critical elements operative within a given situation; prescription to the ability to specify the instructional strategies and content appropriate to the situation; implementation to the ability of a prospective teacher to make an appropriate mix of strategy and content to bring about the desired outcome; and commitment to the feelings which the prospective teacher has about that which has been performed and his utilization of it in his future teaching. Because the assessment of competence requires the assessment of the products that derive from the prospective teacher's behavior all of the measurement methodologies available to the behavioral sciences must again be brought into play.